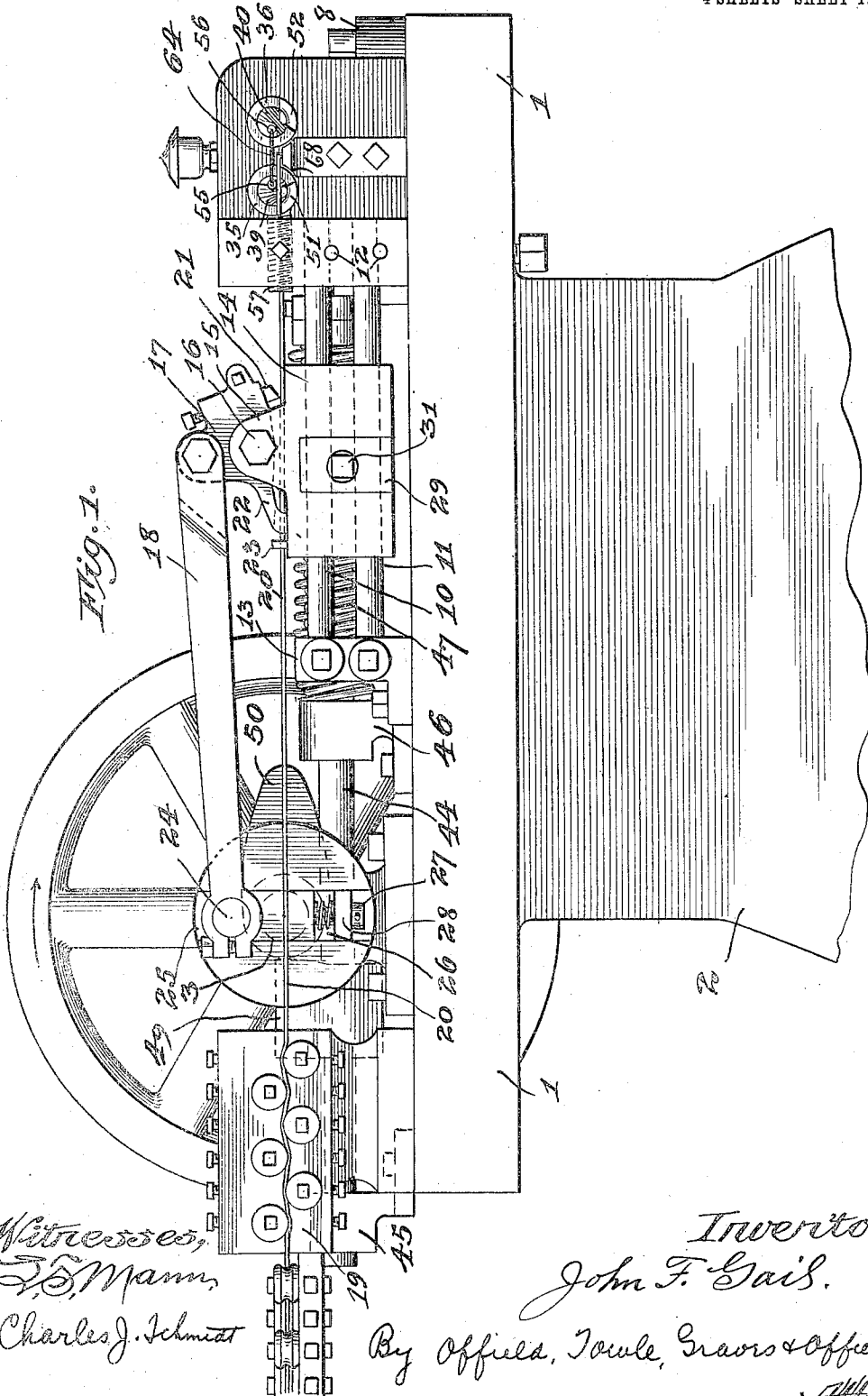


J. F. GAIL.
LINK FORMING MACHINE.
APPLICATION FILED AUG. 2, 1909.

957,203.

Patented May 10, 1910.

4 SHEETS—SHEET 1.



Witnesses,
J. E. Mann,
Charles J. Schmidt

Inventor,
John F. Gail.

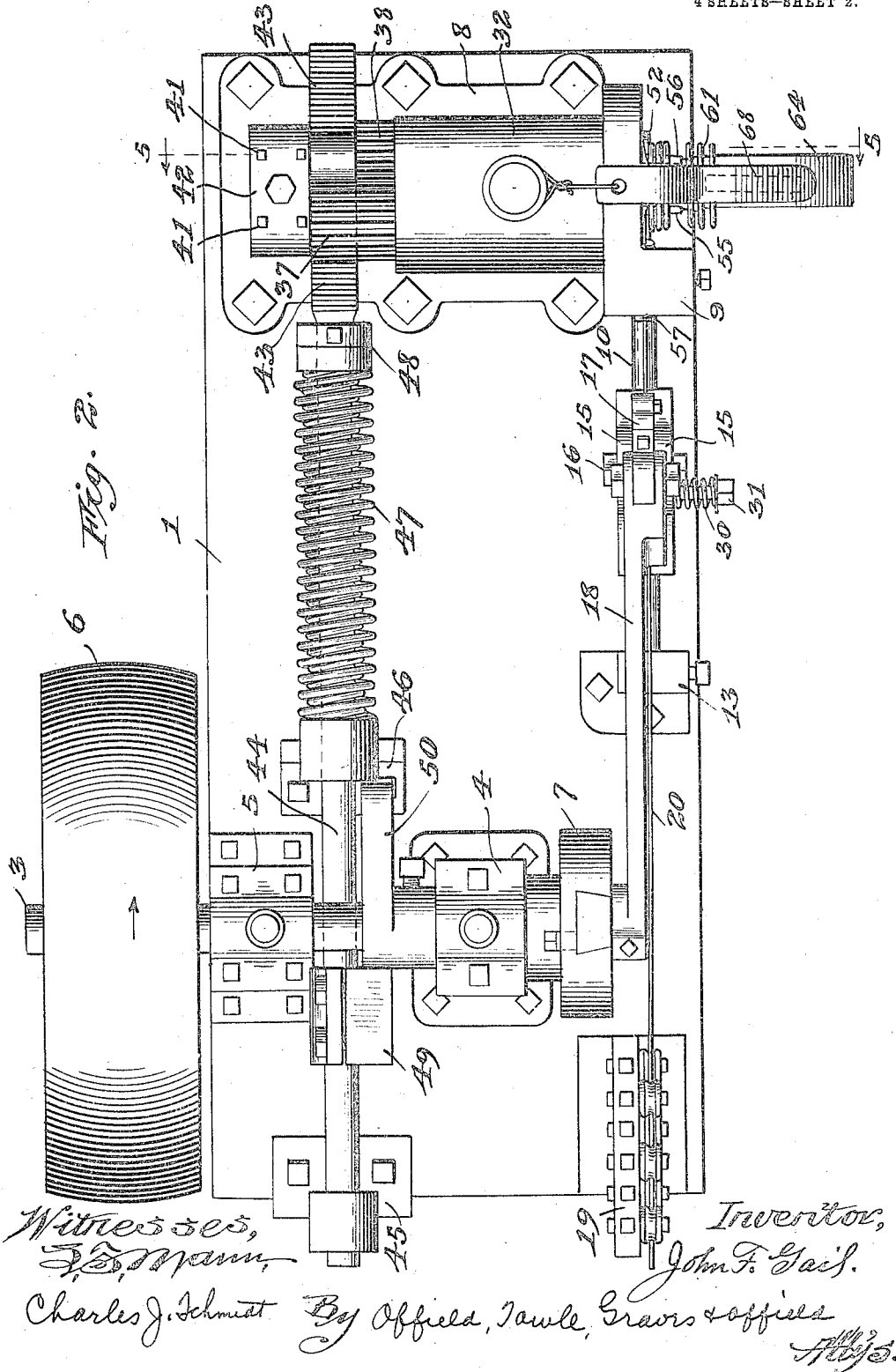
By Office, Towle, Gravers & Office
Attys.

J. F. GAIL.
LINK FORMING MACHINE.
APPLICATION FILED AUG. 2, 1909.

957,203.

Patented May 10, 1910.

4 SHEETS—SHEET 2.



Witnesses,
J. E. Mann,
Charles J. Schmitt

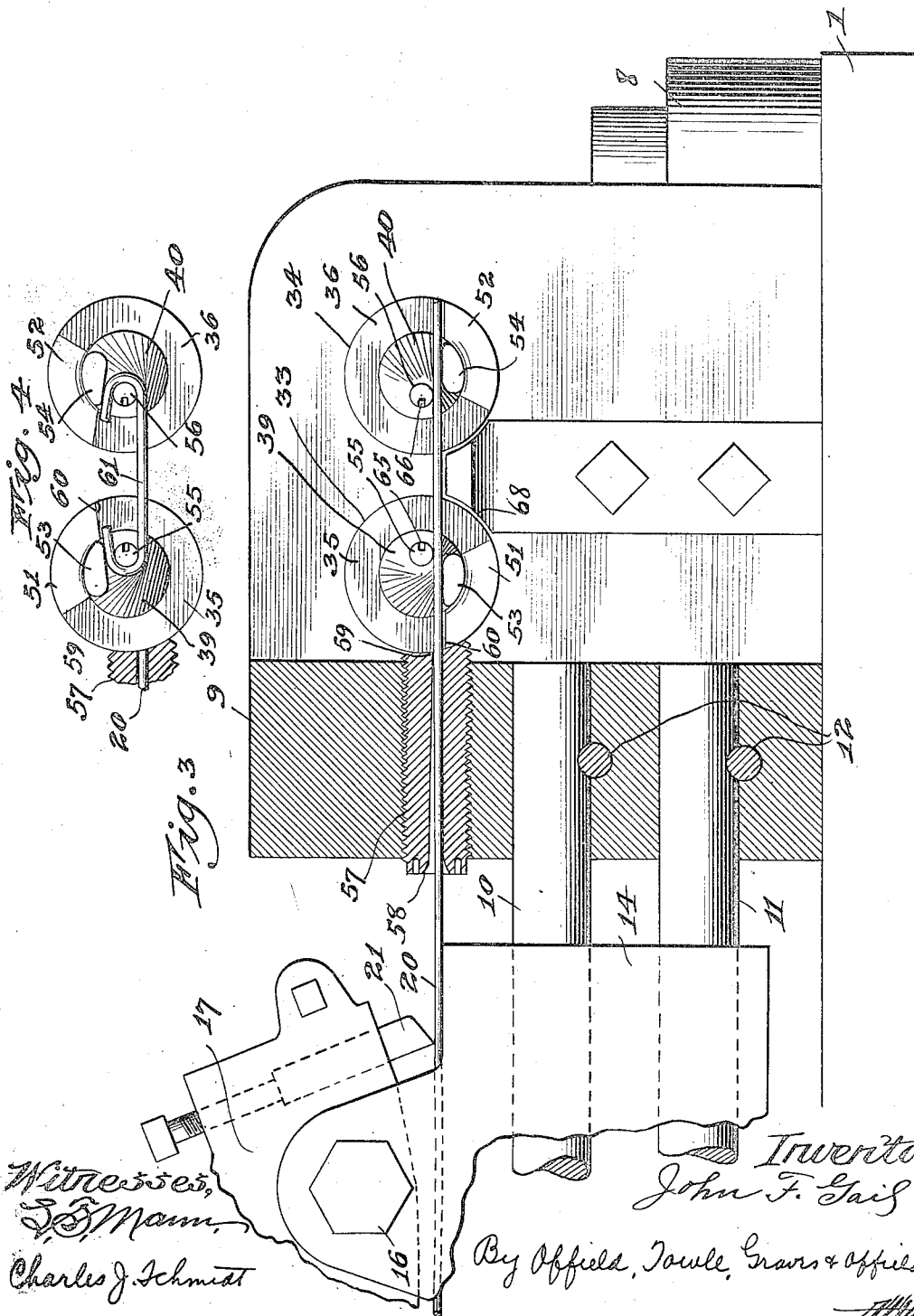
Inventor,
John F. Gail.
By Offield, Pawle, Gravis & Co. Attys.

J. F. GAIL.
LINK FORMING MACHINE.
APPLICATION FILED AUG. 2, 1909.

957,203.

Patented May 10, 1910.

4 SHEETS—SHEET 3.



Witnesses,
J. B. Mann,
Charles J. Schmidt

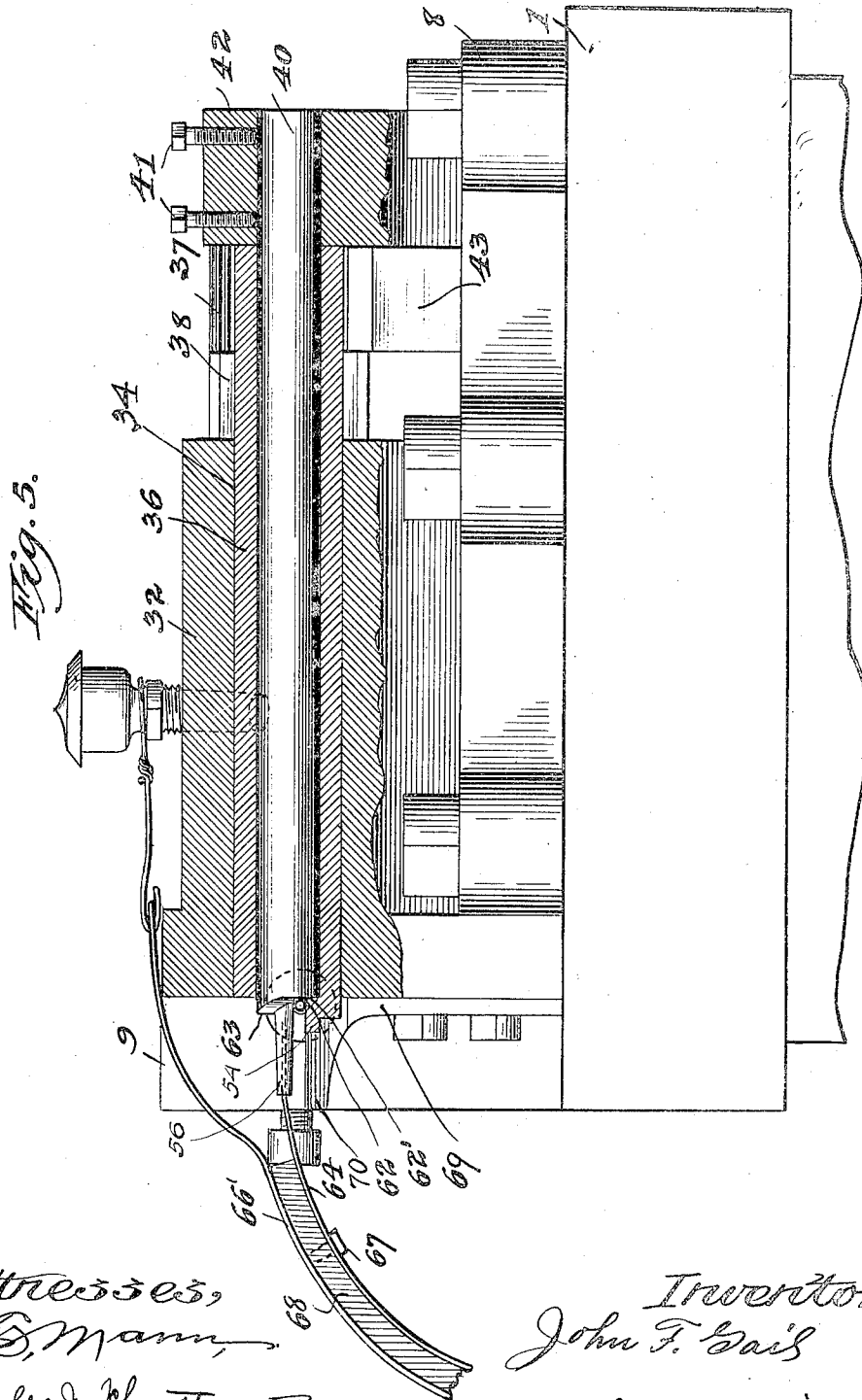
Inventor,
John F. Gail.
By Offield, Towle, Grays & Offield
Attys.

J. F. GAIL.
LINK FORMING MACHINE.
APPLICATION FILED AUG. 2, 1909.

957,203.

Patented May 10, 1910.

4 SHEETS—SHEET 4.



Witnesses,
S. E. Mann,
Charles J. Knuut

Inventor,
John F. Gail

By Offield, Towle, Gravers & Offield
Attys.

UNITED STATES PATENT OFFICE.

JOHN F. GAIL, OF KENOSHA, WISCONSIN, ASSIGNOR TO THE SIMMONS MANUFACTURING COMPANY, OF KENOSHA, WISCONSIN, A CORPORATION OF WISCONSIN.

LINK-FORMING MACHINE.

957,203.

Specification of Letters Patent.

Patented May 10, 1910.

Application filed August 2, 1909. Serial No. 510,763.

To all whom it may concern:

Be it known that I, JOHN F. GAIL, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Link-Forming Machines, of which the following is a complete, clear, full, and precise specification.

My invention relates to link forming machines and particularly to a machine for forming cross links to be used in the manufacture of wire couch fabric.

In my co-pending application, Serial No. 510,765 filed August 2nd, 1909, I have described a machine for manufacturing chains from wire, and in my other co-pending application, Serial No. 510,764, filed August 2nd, 1909, I have described a machine for separating the chain into sections and arranging the sections parallel, while at the same time applying to the adjacent links of the chain sections the cross links for whose manufacture the machine of the present application is particularly designed. The cross links are manufactured with their ends in the form of hooks and these hooks during application of the cross links to the chain sections are closed to form eyes.

One of the main objects of my invention is to provide a machine which is well balanced and which will accurately and rapidly manufacture cross links from raw wire.

Another object of my invention is to provide feed mechanism for conveying the formed links from the machine to be delivered where desired. As pointed out in my second co-pending application referred to, the cross link machines are installed near and above the couch fabric forming machines described in said co-pending application so that the cross links can travel along the bands from the cross link machines directly to the link feed mechanism of the fabric machines.

Other novel features of construction and arrangement are also embodied in the cross link machines of my invention.

In the accompanying drawings which clearly illustrate the machine: Figure 1 is a front elevation of the machine; Fig. 2 is a plan view; Fig. 3 is an enlarged front view of the right end of the machine showing particularly the parts which receive, cut

and form wire sections into links; Fig. 4 is a front end view of the wire forming members showing the position thereof after a link has been formed; and Fig. 5 is an enlarged sectional view taken on plane 5-5, Fig. 2.

The various parts are supported on a bed plate 1 formed at the top of a supporting standard 2. A transverse shaft 3 is journaled on the right end of the body plate in bearing frames 4 and 5. This shaft at its rear end bears a drive pulley 6 and at its front end carries a crank disk 7. Extending transversely across the right end of the body plate is a frame 8 for supporting the various link forming parts. This frame has a projection or flange 9 at its front end in which are secured the right ends of slide bars 10 and 11, these bars passing through opening in said flange and keyed in place by transverse pins 12 as illustrated in Fig. 3. These slide bars lie in a vertical plane and their left ends are supported in a head 13 secured to the body plate between the flange 9 and the crank disk 7. A cross head 14 is slidably mounted on the slide bars and has two upwardly extending lugs 15 between which and on a pin 16 carried by the lugs is pivoted a grip frame 17 to whose upper end is pivoted a connecting rod 18 whose left end connects with the crank disk 7 so that rotation of the shaft 3 will result in longitudinal reciprocation of the cross head on the bars 10 and 11. At the left end of the body plate wire straighteners 19 are mounted through which wire 20 is fed from a reel, this wire passing over the cross head 14 and between the lugs 15 and underneath the gripping frame 17. Adjustably supported in the front end of the grip frame is a grip tooth 21, and extending toward the left from the grip frame is a stop tail 22 whose end is bifurcated to bridge the wire 20. The adjustment of the tooth 21 is such that when the connecting rod is moving to the left the stop 22 will engage the top of the cross head and the edge of the tooth will be free of the wire 20, but upon movement to the right of the connecting rod the clamping frame will be rocked toward the right to engage the tooth edge with the wire so that the wire will be carried with the cross head to be fed to the link forming

parts. One or more pins 23 may extend upwardly from the cross head to assist in guiding the wire. To enable adjustment of the length of stroke of the cross head the left end of the connecting rod pivots to a crank pin 24 which extends from a block 25 slidable in a channel 26 cut diametrically across the crank disk. The block is adjustable in the channel by manipulating a screw 27 passing through an abutment web 28 extending across the channel, such adjustment causing radial shifting of the center of crank pin 24 and, therefore, adjustment of the length of stroke of the cross head. To prevent loose motion and loose operation of the cross head on the slide bars a section of the cross head side is cut out to form a friction plate 29 which is pressed against the slide rods by a spring 30 abutting against said plate and against the head 31 of a screw which extends forwardly from the cross head body.

The front part 32 has two bores 33 and 34 which are in a common horizontal plane and parallel. The bores respectively journal the sleeves 35 and 36 which at their rear ends, respectively, carry pinions 37 and 38. Also extending through the sleeves are mandrels 39 and 40, respectively, whose rear ends are rigidly secured by means of set screws 41 in a wall 42 forming part of the frame 8. The pinion 37 extends between the rear end of part 32 and the wall 42 and meshes with a rack 43 guided on the frame 8 below said pinion. The pinion 38 extends between the part 32 and the rack bar and does not mesh with the rack bar, but meshes with the pinion 37. Lateral displacement of the rack bar 43 is prevented by the pinion 38 and the wall 42, and upon longitudinal reciprocation of the rack bar forming sleeves 35 and 36 are rotated in opposite directions. The rack bar is carried at the right end of a shaft or rod 44 slidably mounted in bearing frames 45 and 46 extending from the bed plate. Compression springs 47 encircle the shaft between the bearing frame 46 and a collar 48 secured to the shaft. Clamped to the shaft to the left of the main shaft 3 is a cam block 49 which is in the path of a cam arm 50 secured to the shaft 3. During each revolution of the shafts the cam arm 50 will engage with the cam block 49 to carry the rack bar 43 to the left and upon release of the block 49 the springs 47 return the rack bar to the right.

Referring particularly to Figs. 3, 4, and 5 the sleeves 35 and 36 have segmental extensions 51 and 52, respectively, from whose inner edges extend forming tongues 53 and 54, respectively, whose side edges are rounded. Extending forwardly from the mandrels 39 and 40 are pins 55 and 56, respectively, and these pins extend from points inside the centers of the mandrels. Dur-

ing a period of 180 degrees rotation of the shaft 3, the rotation positions of the link forming parts are as shown in Fig. 3, the upper faces of the extensions and forming tongues being practically in a common horizontal plane so that wire may be fed across said surface below the forming pins. The wire enters through a steel plug 57 which threads through the flange 9 and whose central bore 58 lies in the plane of the top surfaces referred to. The inner end of the plug is concaved to fit the cylindrical outer surface of the sleeve 35 and extension 51 so that the point 59 forms a knife edge to cooperate with the point 60 at the left end of the extension 51. During the next 180 degrees rotation of the shaft 3 the sleeves will be rotated to the position shown in Fig. 4, sleeve 35 rotating in a clockwise direction and sleeve 36 rotating in a counter-clockwise direction, and during this rotation the knife edges will have engaged and severed the wire and the severed section will have been bent over at the ends to form a link 61. Turning over of the ends is accomplished as the extensions and tongues engage the respective ends of the severed section and carry these ends about the stationary pins 55 and 56, respectively. The tongues 53 and 54 extend just a trifle higher than the upper faces of the extensions and these tongues give the bent ends a final pressure to draw them securely about the pins so that perfect and uniform hooks are formed as shown in Fig. 4. After the formation of a link it is necessary that the link be removed from the vertical plane or field of operation to make way for the succeeding section of wire. This is accomplished as best shown in Fig. 5. The front straight faces 62 of the mandrels 39 and 40 abut against the rear ends of the forming tongues and the fed in wire sections engage against these faces. Above this straight surface the ends of the mandrels have ejecting ridges or inclines 63 and these ridges appear just over the forming pins which are prolonged outwardly as shown. With this construction when the sleeves start to rotate the ends of the severed section are engaged both by the extensions 51 and 52 and the tongues 53 and 54, but toward the end of such rotation the ends engage with the inclines of the ridges and the links are forced outwardly and at the end of the rotation of the sleeve the links are engaged only by the tongue to be given the final forming pressure. Each link, therefore, after formation has been forced forwardly out of the vertical plane or forming field in which successive sections are fed, and each during formation, forces the preceding links forwardly along the pins. The inner edges of the tongues are cut away a bit at 62' to receive the inclines when the sleeves rotate. The links could be received

in suitable receptacles as they fall from the pins or can be transferred to suitable transfer mechanism to be delivered at a distance from the machines. As shown, I have provided a band 64 for receiving the hooks of the links about its edges and along which band the links travel to be delivered to any desired place, or as is shown in my second co-pending application, referred to, to be delivered to the cross link feed mechanism of the couch fabric machine where the cross links are applied to the chains to form with these chains the finished fabric. To support the end of the band its edges at the end engage in grooves 65 and 66 cut in the opposed faces of the pins so that when the hooks of the links leave the pins they will engage about the edges of the band. The band may be further held in place by a top strip 66' secured to the band by bolts 67, a spacing block 68 being interposed. The inner end of the band can be fastened in any manner to the machine frame as illustrated in Fig. 5. To assist in guiding the links and also to prevent buckling thereof during formation, a bracket 69 is secured to the front of the forming frame with its horizontal arm 70 extending forwardly between the forming sleeves to hold the centers of the links.

The entire operation of the machine can be readily followed. In the positions shown in Figs. 1 and 2, the cross head is at the center of a stroke, the main shaft 3 rotating in clockwise direction and a wire being fed half way into the forming frame. During the next 90 degrees rotation the wire will have been completely fed in as shown in Fig. 3 and the cam arm 50 will have just reached the block 49 on the rack bar shaft. During the next 90 degrees rotation this cam arm will move the rack bar to the left to rotate the forming sleeve to form a link and during the next 90 degrees rotation springs 47 will return the links to their normal position, and at the end of this last 90 degrees rotation the cross head will be at the left of its stroke so that during the next 180 degrees of rotation a new section of wire will be fed to the forming mechanism. During 180 degrees rotation, therefore, of the driving shaft the wire is fed to the forming mechanism and during the next 180 degrees the forming mechanism is actuated to form the link.

The machine as described is simple, well balanced and efficient in operation. There is no waste of material and a great number of links can be turned out in a very short time.

Changes both in construction and arrangement are possible which would still come within the scope of my invention and I therefore do not wish to be limited to the exact arrangement of construction shown.

I desire to secure the following claims.

1. In a link forming machine, the combination of a forming pin, a forming tongue, means for feeding a wire section, into a forming plane between said pin and tongue, means for bodily carrying said tongue about said pin to bend the wire, and means for causing gradual movement of the wire away from the forming plane during the bending operation.

2. In a link forming machine, the combination of two parallel stationary mandrels, a forming pin extending from each mandrel, a forming sleeve journaled on each mandrel and having a forming tongue extending therefrom adjacent the corresponding pin, means for feeding wire sections into a forming plane between said tongues and pins, means for simultaneously rotating the sleeves to cause the tongues to carry the ends of a fed in section about the pins to form hooks, and means for automatically moving a link from the forming plane during formation thereof to make way for the feeding of a succeeding section into the forming plane.

3. In a link forming machine, the combination of two parallel and horizontal stationary mandrels, a forming pin extending forwardly from each mandrel, a forming sleeve journaled on each mandrel and having a forming tongue extending forwardly therefrom adjacent said pin, means for feeding wire sections into a vertical forming plane between said tongues and pins, means for simultaneously rotating said sleeves to cause the tongues to carry the ends of the fed in sections about said pins to form hooks, and an ejecting ridge at the end of each mandrel for moving a formed link forwardly out of the vertical forming plane to make way for feeding of a succeeding section into the plane.

4. In a link forming machine, the combination of rotatable forming sleeves each having a forming tongue extending from one end thereof, a pin within each sleeve, a cutting edge on one of said sleeves, a feed frame having a feed opening terminating with a sharp edge in the path of said cutting edge, means for feeding wire through said feed opening and between the tongues and pins, and means for rotating said sleeves to cause a section to be cut from the fed-in wire by the cooperating cutting edges and the ends of the section carried by said tongue about said pins to form hooks.

5. In a link forming machine, the combination of a supporting frame, two forming sleeves journaled in said frame and each having a forming tongue extending forwardly therefrom, a stationary pin within each sleeve and adjacent the sleeve tongue, said frame having a feed opening there-through and the frame at the end of said

feed opening engaging against one of said sleeves, the inner end of said opening forming a cutting edge, an extension from the sleeve adjacent said frame having a cutting edge for cooperating with the cutting edge of the frame, means for feeding wire through said opening between said cutting edges and between the forming tongues and pins, means for rotating said sleeve to first bring the cutting edges together to cut a section from the wire and then to cause the forming tongues to carry the ends to the section about the pins to form hooks, and means for automatically moving a link from the plane of the feed opening to make way for subsequent feeding of wire between the forming tongues and pins.

6. In a link forming machine, the combination of a supporting frame, two forming pins extending from said frame, a rotatable forming sleeve surrounding each pin, a forming tongue extending from each sleeve, means for feeding wire sections between said tongues and pins, means for rotating said sleeves to draw the ends of a wire section about the pins to form hooks and thereby a link, and a band for conveying the formed links from the pins.

7. In a link forming machine, the combination of a supporting frame, two forming pins extending from said frame, a rotatable forming sleeve surrounding each pin, a forming tongue extending from each sleeve, means for feeding wire sections between said tongues and pins, means for rotating said sleeves to draw the ends of a section about the pins to form hooks and thereby a link, a band for conveying the formed links from the pins, and means for forcing the formed links on to said band.

8. In a link forming machine, the combination of a supporting frame, two forming pins extending from said frame, a rotatable forming sleeve surrounding each pin, a forming tongue extending from each sleeve, means for feeding wire sections between said tongues and pins, means for rotating said sleeves to draw the ends of a section about the pins to form hooks and thereby a link, a band for conveying the formed links from the pins, and ejecting ridges extending from the supporting frame for engaging the links during formation thereof to force said links longitudinally along and from said pins.

9. In a link forming machine, the combination of a supporting frame, two forming pins extending from said frame, a rotatable forming sleeve surrounding each pin, a forming tongue extending from each sleeve, means for feeding wire sections between said tongues and pins, means for rotating said sleeves to draw the ends of a section about the pins to form hooks and thereby a link, a band for conveying the formed links from

the pins, and a delivery member engaging with the ends of the pins to receive the links from the pins.

10. In a bending machine, the combination of a forming pin, a sleeve surrounding said pin, a forming tongue, means for feeding wire into the forming field between said tongue and pin, means for rotating the sleeve to cause the tongue to bend the wire about said pin, and means for moving said wire along said pin and away from the forming field during formation thereof.

11. In a bending machine, the combination of a stationary forming pin, a sleeve surrounding said pin, a forming tongue extending from said sleeve adjacent said pin, means for feeding wire sections into a forming field between said tongue and pin, means for rotating said sleeve to cause the tongue to carry and to bend the wire about said pin, and an incline formed adjacent said pin, the formed wire engaging said incline to be moved thereby out of the forming field to make way for a succeeding fed in section of wire.

12. In a bending machine, the combination of a forming pin, a sleeve surrounding said pin, a forming tongue extending from said sleeve adjacent said pin, means for feeding wire sections between said tongue and pin, means for rotating said sleeve to cause the forming tongue to bend a fed in section transversely about said pin, and means for causing longitudinal movement of the wire section along the pin during bending of said section whereby the finished section will be moved to make way for feeding in of a successive section.

13. In a bending machine, the combination of a stationary forming pin, a sleeve surrounding said pin, a forming tongue extending from said sleeve adjacent said pin, means for feeding wire sections between said tongue and pin, means for rotating said sleeve to cause the tongue to carry and to bend the fed in section transversely about said pin, and an incline formed adjacent said pin, said incline being engaged by the wire section during bending thereof to move the wire section longitudinally on said pin to make way for the feeding in of a succeeding wire.

14. In a link forming machine, the combination of two elongated forming pins, means for feeding a wire section into a forming plane at one end of said pins, means for rotating one of said pins about the other to bend the wire, and means for causing movement of the wire toward the other end of said pins and out of the forming plane during the bending period.

15. In a machine for forming uniplanar links, the combination of forming pins, forming tongues, means for feeding wire

into a forming plane between said pins and
tongues, means for bodily carrying said
tongues about said pins to bend the ends of
the wire and to form the uniplanar link, and
5 means for causing the wire to move grad-
ually away from the forming plane during
the bending operation.

In witness hereof, I hereunto subscribe
my name this 30 day of July, 1909.

JOHN F. GAIL.

Witnesses:

GUS JACOB,
C. E. HAWLEY.